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AN OPTIMIZED APPROACH IN 3G MOBILE SYSTEMS DEPLOYMENT

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Characteristics of cellular systems development

- **Since its inception the cellular system**
  - Experienced enormous growth
- **Need for high rate data capacity**
  - Recognized by various standards bodies
- **Efforts in way to add additional data rate capabilities to existing cellular standards**
  - GSM (GPRS, EDGE)
  - IS-95A (IS-95 B)
  - IS-136 (GPRS, EDGE)
- **Needs are becoming more data centric**
  - Need internet capable connection
  - e-mail, short message services
  - web browsing
- **Connection becoming more and more packet switched**

Why not 2G anymore?

- **1G and 2G systems were developed**
  - to accommodate mainly voice services
  - 2G added the limited data capabilities
  - applications were voice centric
  - utilized the circuit switched connection
- **Very limited roaming**
  - communication any where, any time still far from reality
  - Localized standards inhibits global roaming and seamless communication
    - North America (AMPS, IS-136, IS-95, PCS-1900)
    - Japan (PDC, PHS, IS-95), Asia (GSM, IS-95, AMPS and others)
    - Europe (GSM, DCS 1800 etc.)
- **Capabilities still below par to its landline rival**
  - Data Throughput
  - Web Browsing
  - Multimedia services/support
- **Basic services**
  - unaffordable to majority of the world population

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Driving factors for 3G implementation

- **Unified global cellular standard**
  - One standard covers the globe
- **Wireless Service offerings**
  - Matching to the Public Switched Telephone Network (PSTN)
- **Efficient usage of the available spectrum**
  - Wide coverage, Large Capacity
  - Affordable
- **Flexible to accommodate any future requirements**
  - Easy to add-on new services

Driving factors for 3G implementation

- **Wireless connectivity to Internet**
- **Phenomenal growth in cellular subscribers**
- **Multimedia capable terminals**
  - Video streaming
  - Simultaneous voice/data/browsing capability
- **Killer application**
  - Multimedia capable service offering
- **New source of Revenue**
  - Voice market is saturating
  - Demand for data services increasing

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Global situation

- **Year 2002**
  - Reached almost 1 billion wireless subscribers
- **Two major wireless network architectures**:
  - ANSI-41 and
  - GSM/MAP
    - Deployed over 100 countries
- **Large investment requires each to have an evolutionary path to 3 G**
- **Hence, adoption of ITU "family of systems" approach**

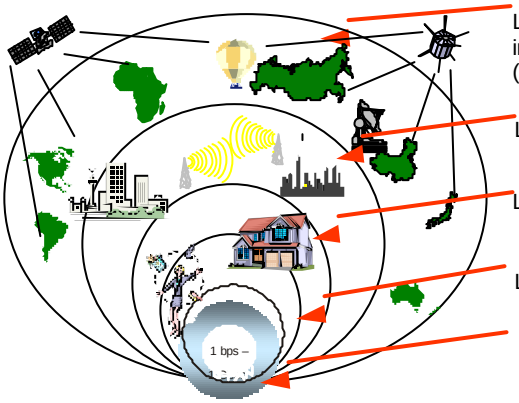
ITU objectives for IMT-2000

IMT-2000 (3G) networks should provide access, by means of one or more radio links, to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN/ISDN/IP), and to other services which are specific to mobile users.

Key features of such wireless cellular systems should be:

- high degree of commonality of design world-wide;
- compatibility of services within 3G standards and with the fixed networks;
- high quality;
- small terminal for world-wide use;
- world-wide roaming capability;
- capability for multimedia applications, and a wide range of services and terminals;
- support of a limited number of different radio interface technologies within the 3G family.

Five Layers Wireless Communications



Layer 1 – Global Satellite Communication incl. High-Altitude Platform Systems (HAPS)

Layer 2 – Global Cellular Communication IMT-2000

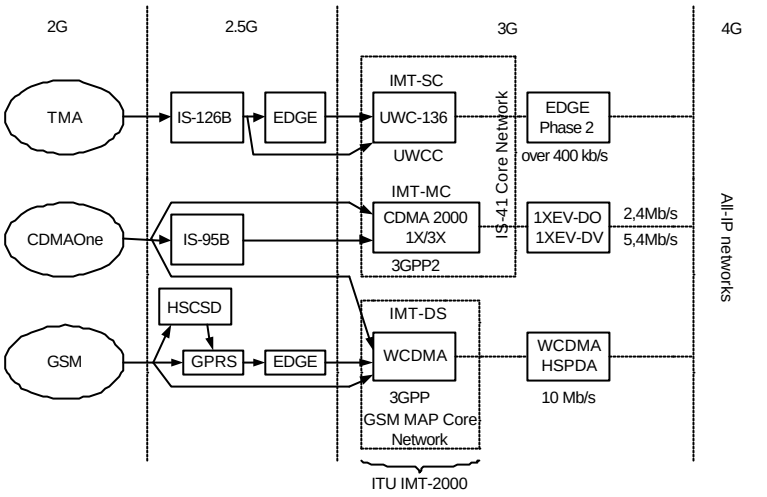
Layer 3 – Global Wireless LAN

Layer 4 – Global Wireless PAN (LPRF)

Layer 5 – Global B-PAN (mmwave)

5-layers Wireless Communications provide mobile everywhere and they compliment to each other.

Migration scenarios towards 3G networks



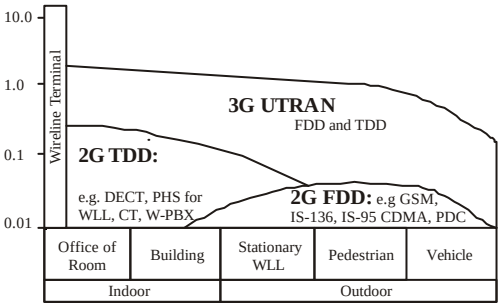
Global 2G and 3G standards

(2+3)G Operator needs

- Dual mode 3G/2G terminals
- 3G/2G coverage
- 3G/2G service handover
- Reuse of 2G cell site grid
- Reuse of 2G networks
- Reuse of 2G spectrum due to later refarming

USA
2G: PCS + MAP
3G: UTRAN + MAP+
2G: IS-95 + ANSI - 41
3G: cdma2000 + ANSI – 41+
2G: IS-136 + ANSI - 41
3G: TDMA/136, EDGE ANSI-41+

Europe
2G: GSM + MAP
3G: UTRAN + MAP+



DEPLOYMENT STRATEGIES FOR 3G SYSTEMS

When choosing an adequate approach for 3G systems deployment, the following elements have to be considered:

- **network type (private -public),**
- **coverage (local-global),**
- **mobility (low-high),**
- **data traffic (low-high),**
- **types of services (basic-multimedia).**

Thus, two approaches may be identified:

Scenario 1 – innovative, applied through implementation of the completely new 3G network

Scenario 2 – evolutionary, applied through migration (upgrade) of already existing 2G or 2G+ network

DEPLOYMENT SCENARIO No.1

In this type of scenario the following versions may appear:

- **SCENARIO No.1(a): All-round**
  3G network is implemented where no 2G network exists both in terms of deployment area and the transmission rate

- **SCENARIO No.1(b): Complement**
  3G network is implemented in the region with already existing 2G network(s) in a way that it could be:
  - **Area-complement** – 3G covers the whole range of the transmission rate and is located in the position not covered by 2G networks in the terms of the deployment area
  - **Rate-complement** – 3G covers the whole range of the deployment area and is located in the position not covered by 2G networks in terms of the transmission rate.

COMPARISON OF SCENARIOS No.1(a) AND No.1(b)

	All-round-type scenario	Complement-type scenarios
Transmission bit rate	From lower to higher rates	Higher rate
Mobility	From static to cellular mobility	Cellular mobility
Deployment Area	From pico to macro cells	Micro and macro cells
Network interface	If necessary	Indispensable
System roaming	If necessary	Indispensable
Radio interface	Single	Multiple
Mobile terminal mode	Single	Multiple
Security	Whole system	Core network
Billing/charging	Unified system	Multiple systems
Core network	Customized	Transparent
Service provider	Single	Multiple
2G, 3G and other mobile systems	Overlap	Complement

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DEPLOYMENT SCENARIO No.2

There are two possible ways for mobile operators to migrate from 2G (2G+) to 3G:

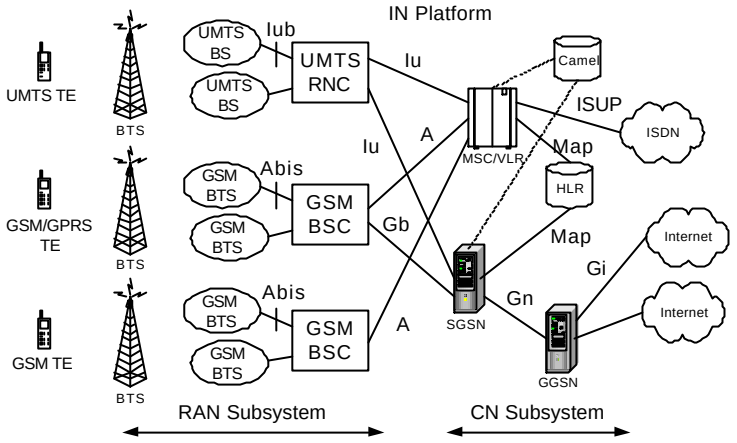
- **Scenario No.2(a):**

Existing 2G or 2G+ core network could be upgrade for 3G use. In this case 2G and 3G networks share the same core infrastructure.

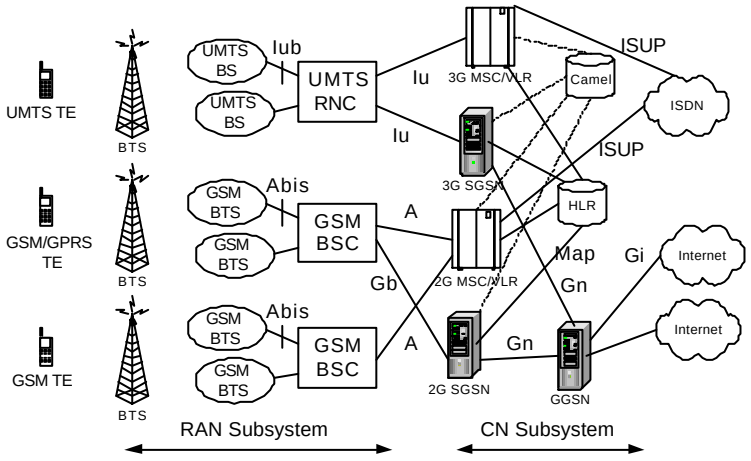
- **Scenario No.2(b):**

Independent 3G core network could be implemented completely independent from the existing 2G core infrastructure.

SCENARIO No.2 (a):
COMMON CORE NETWORK FOR 2G AND 3G



SCENARIO No.2 (b):
INDEPENDENT 2G AND 3G CORE NETWORKS



IMPACTS OF SCENARIOS No.2 ON EXISTING 2G NETWORKS

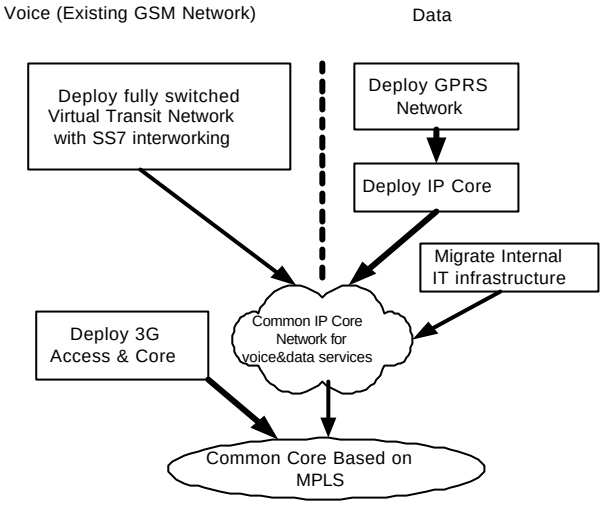
- **SCENARIO No.2(a):**
  - Re-dimension of the existing core network to be able to support 3G broadband services
  - Optimize transmission network for a suitable traffic mix
  - Network management system
- **SCENARIO No.2(b):**
  - 2G and 3G networks have minimum impact on each other

DEPLOYMENT SCENARIO No.2:
Optimized implementation

The use of a single homogenous network based upon IP becomes the logical choice for the delivery of seamless services within mobile networks and allows these service to span the voice, data and video domains – thus migrating the mobile network towards a true multimedia capability.

This can be achieved by migrating all of the services and applications within the mobile network onto packet based (IP or IP+ATM) network. The most logical way for that would be if the packet based platform migrates from the core network towards radio access network.

DEPLOYMENT SCENARIO No.2:
Optimized implementation



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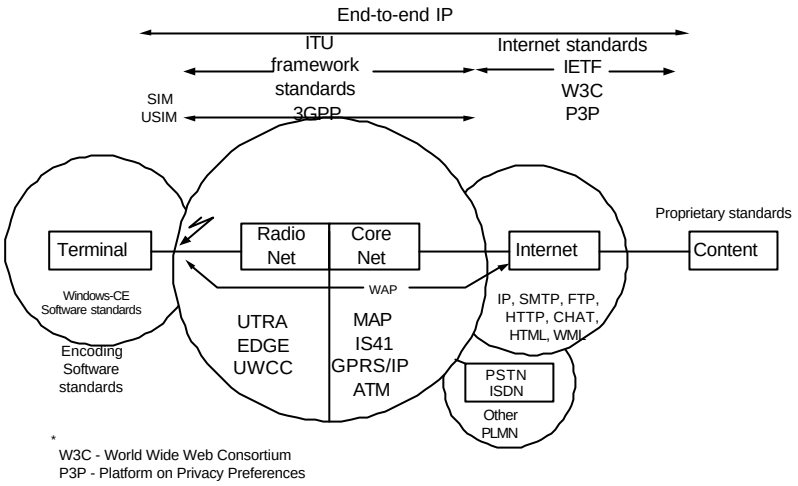
DEPLOYMENT SCENARIO No.2:
Optimized implementation

The new IP Multimedia Core Network subsystem introducing All-IP environment is implemented in a way to enable two major benefits:

- Transport: utilization of the IP transport and connectivity with QoS throughout the network
- End-user services: with Session Initiation Protocol (SIP) possibilities to offer wide range of totally new type of services.

Also, MPLS enables utilization of a single physical infrastructure, switches and transmission links, for both types of traffic: native-ATM and IP.

FUTURE STANDARDIZATION ACTIONS



* W3C - World Wide Web Consortium
P3P - Platform on Privacy Preferences